MINERALOGY OF AN UNUSUAL Cr-RICH INCLUSION IN THE LOS MARTINEZ (L6) CHONDRITIC BRECCIA. Adrian J. Brearley[1], I. Casanova[2], M.L. Miller[1] and Klaus Keil[3]. [1]Institute of Meteoritics and Department of Geology, University of New Mexico, Albuquerque, New Mexico 87131-1126. [2]SN2/Planetary Science Branch, NASA/Johnson Space Center, Houston, TX 77058. [3]Planetary Geosciences Division, School of Ocean and Earth Science and Technology, University of Hawaii, Honolulu, HI 96822.

During a petrological study of the L6 chondritic breccia, Los Martinez, we discovered a large, highly unusual Cr-rich inclusion whose mineralogy appears to be unique in both terrestrial and extraterrestrial occurrences. We have carried out electron microprobe, SEM and TEM investigations of this inclusion in order to determine its composition and mineralogy in detail and to establish its origin and possible relationship to other Cr-rich objects in chondritic meteorites. Optical studies of the inclusion (3x3 mm in size) show that it consists of a cloudy core grading into an opaque rim on the outer 200 μm of the inclusion. Backscattered electron imaging shows that this clouding is due to the presence of myriad opaque particles which are present in the core of the inclusion and increase dramatically in abundance toward the rim. Broad beam electron microprobe traverses across the inclusion show that it is compositionally highly zoned with a Si, Ca and Al-rich core. The core composition superficially resembles an anorthitic plagioclase, but in detail is significantly depleted in Si and enriched in Al relative to stoichiometric plagioclase. As the rim is approached there is a dramatic increase in the concentrations of Cr_2O_3 (24 wt%), FeO (12 wt%) and Na_2O (5 wt%), whilst CaO, SiO_2 and Al_2O_3 show concomitant decreases. TEM studies of the inclusion show that the second phase particles observed by BSE imaging are Cr-rich spinels with a grain size of 0.3-3 μm, which are set in a plagioclase host. In the very outer rim the spinel constitutes ~50 vol% of the inclusion. The spinel crystals throughout the inclusion are always oriented with respect to the plagioclase and have the crystallographic orientation relationship $[110]_{sp}//[221]_{pl}$ and $(110)_{sp}//(110)_{pl}$. Such a relationship is consistent with exsolution of the spinel at some stage during the inclusion's thermal history. Analytical electron microscope studies reveal that the composition of the spinel and the coexisting plagioclase vary dramatically along the zoning profile found by electron microprobe studies. At the rim the spinels are essentially chromite and coexist with an albitic plagioclase (Ab_{84}), but in the core spinels become more aluminous and Mg-rich and coexist with calcic plagioclase (An_{85}).

The origin and thermal history of the inclusion appears to be complex and unusual. Mineralogically and compositionally the inclusion may be most closely related to the chromite-plagioclase chondrules found in ordinary chondrites [1], although it differs considerably in texture. The zoning in the inclusion appears to be consistent with fractional crystallization from a small volume of melt, as indicated by the rapid increase in incompatible element concentrations in the rim. The origin of this melt is problematical, but it may have been a liquid condensate of some kind, because its composition (ignoring Cr) plots on the theoretical trajectories for liquid condensates in the system $(CaO+Al_2O_3)$-SiO_2-MgO [2,3]. One of the most enigmatic features of the inclusion is the problem of exactly what phase crystallized from this liquid. We believe that the spinel is the product of an exsolution reaction from a host phase, which had the local bulk chemistry of the inclusion. However, the composition of the inclusion is not consistent with any known phase and appears to be intermediate in composition between a plagioclase and a Ca-Tschermak-rich pyroxene. This phase may have been a metastable crystallization product. We suggest that exsolution and decomposition of this phase to the observed plagioclase and chromite intergrowth occurred at high temperature, probably during parent body metamorphism.

References. [1] Ramdohr, P. (1967) *GCA*, **31**: 1961-1967. [2] Wagner, R.D. and Larimer, J.W. (1978) *Meteoritics* **12**, 651. [3] Wark, D.A. (1987) *GCA* **51**, 221-242.